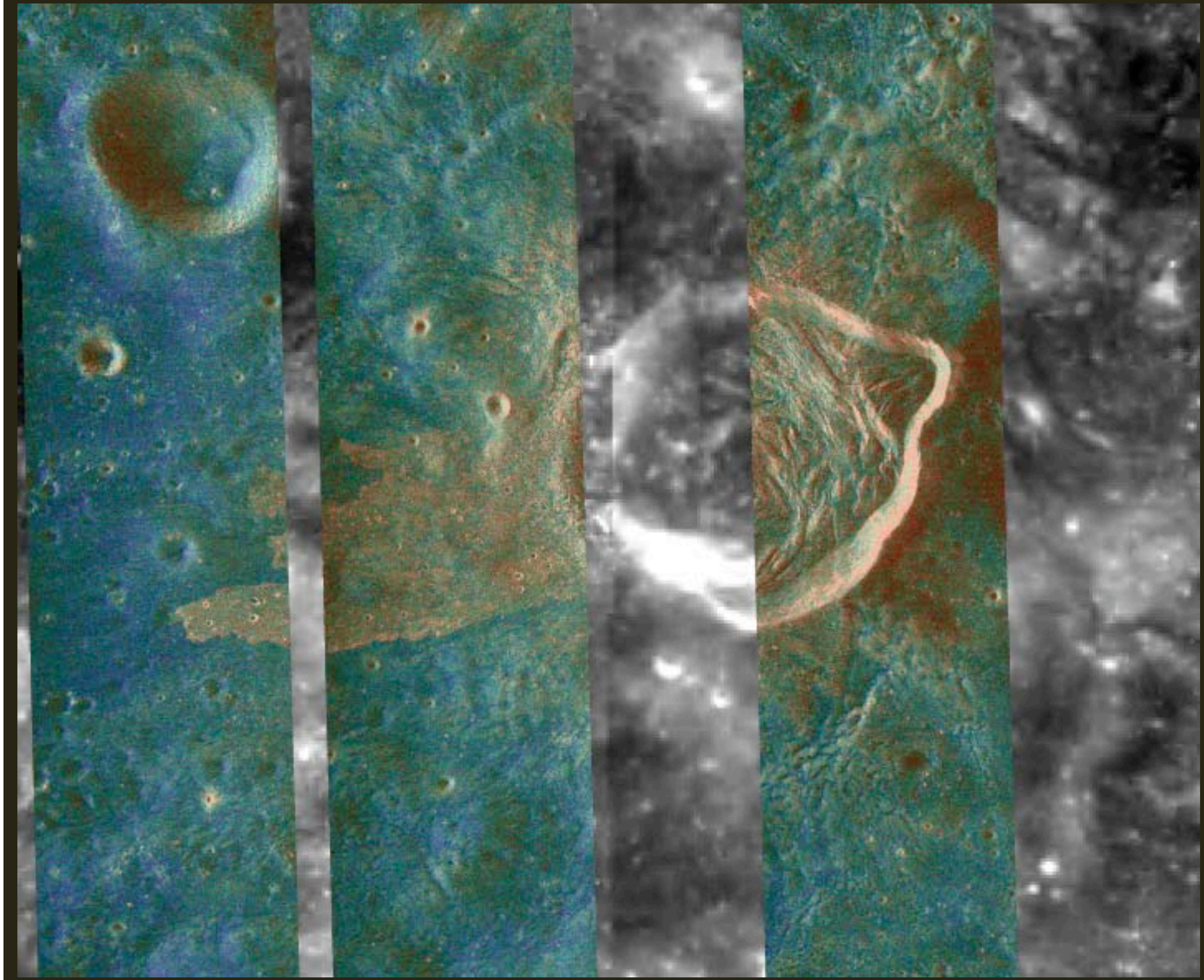
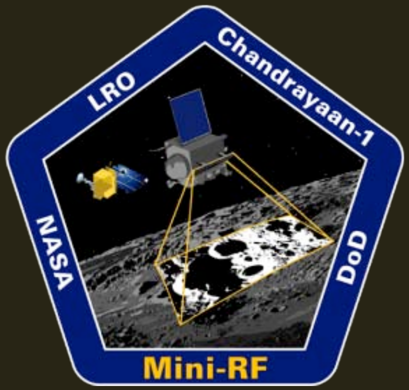
Scientific Highlights from Mini-RF

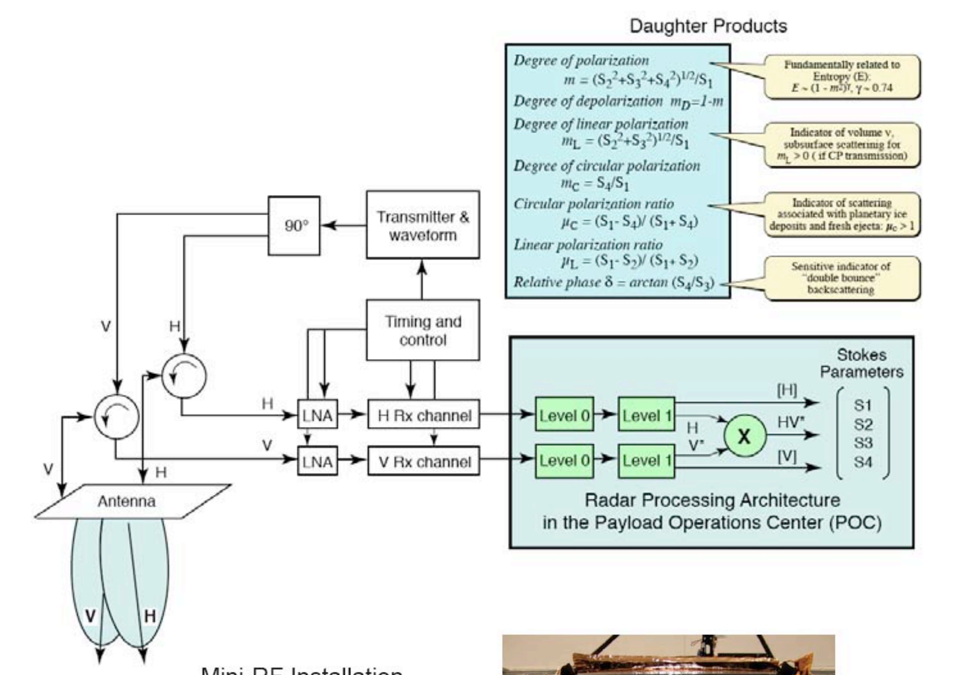


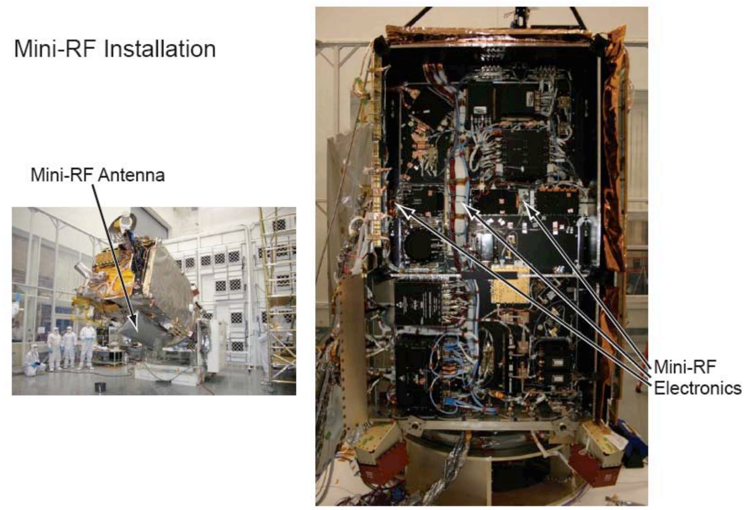


Ben Bussey
& the Mini-RF
Team

Mini-RF Instrument Description

- Two-band, two-resolution imaging radar
  - S-band (λ=12.6 cm)
  - X-band (λ=4.2 cm)
  - SAR Baseline 150 m
  - Zoom 15x30 m
- Mini-RF can measure topography
  - Interferometry: 15 m/pix spatial, sub-meter vertical resolution
  - SAR-stereo: 50 m/pix spatial, ~10 m vertical
- Hybrid architecture polarimetric SAR
  - Transmit LCP; Receive *H*- and *V*- linear coherently
  - Four Stokes parameters derived
- Low mass and power requirements
  - 13 kg, 150 W





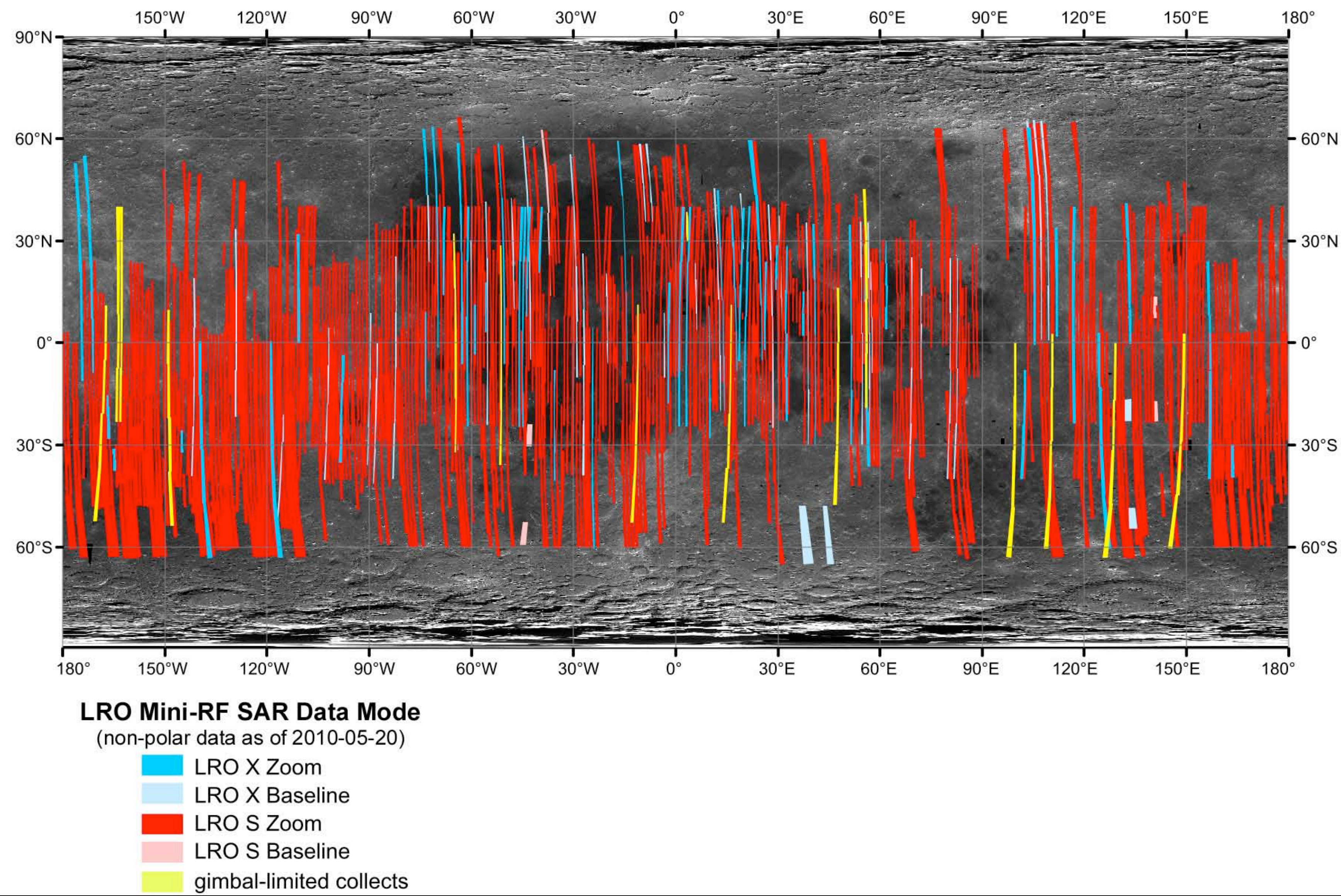
Mini-RF: A Unique State-of-the-Art Orbiting Radar Observatory

> Mini-RF Imaging Radar on LRO is equivalent (from a science point of view) to the Arecibo-Green Bank Radio Telescope combination

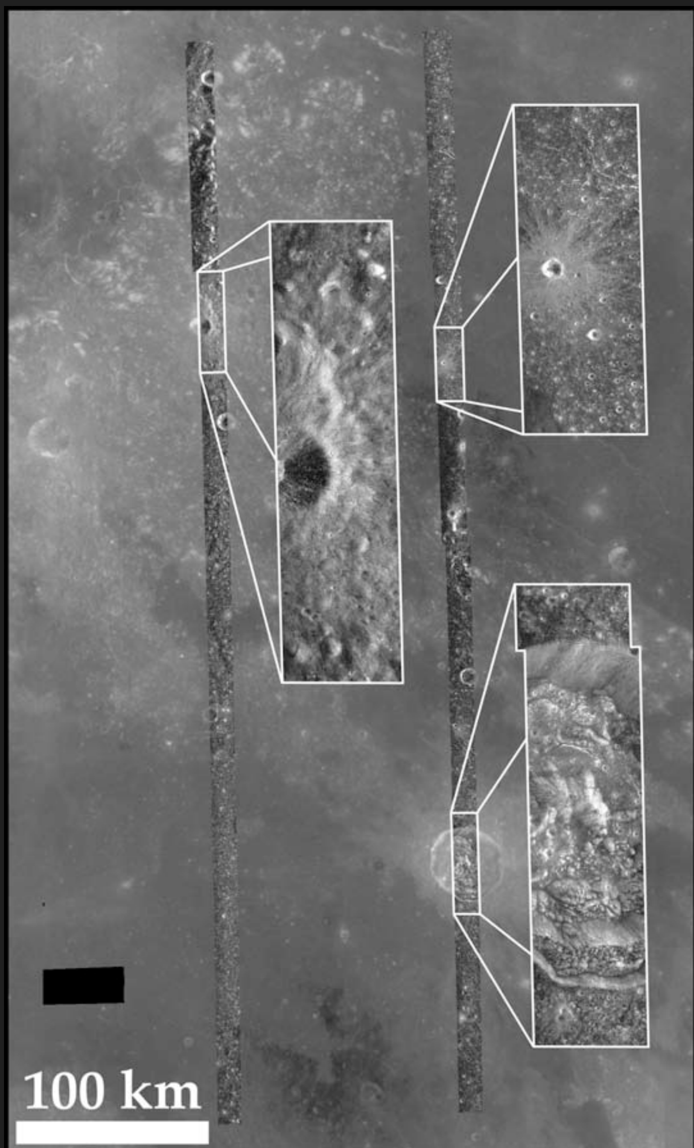
> Mini-RF is the first orbital radar to provide the 4-element Stokes vector at two different wavelengths

> Mini-RF has equal viewing opportunities at the lunar poles, and the entire surface including the far side

Non-Polar Coverage up to May 25 2010

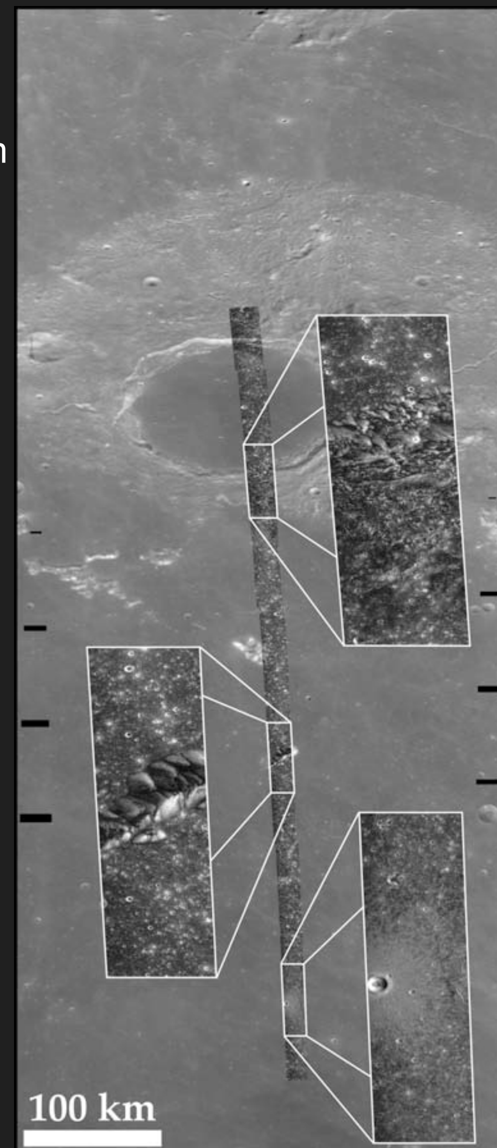


Examples of Mini-RF Data



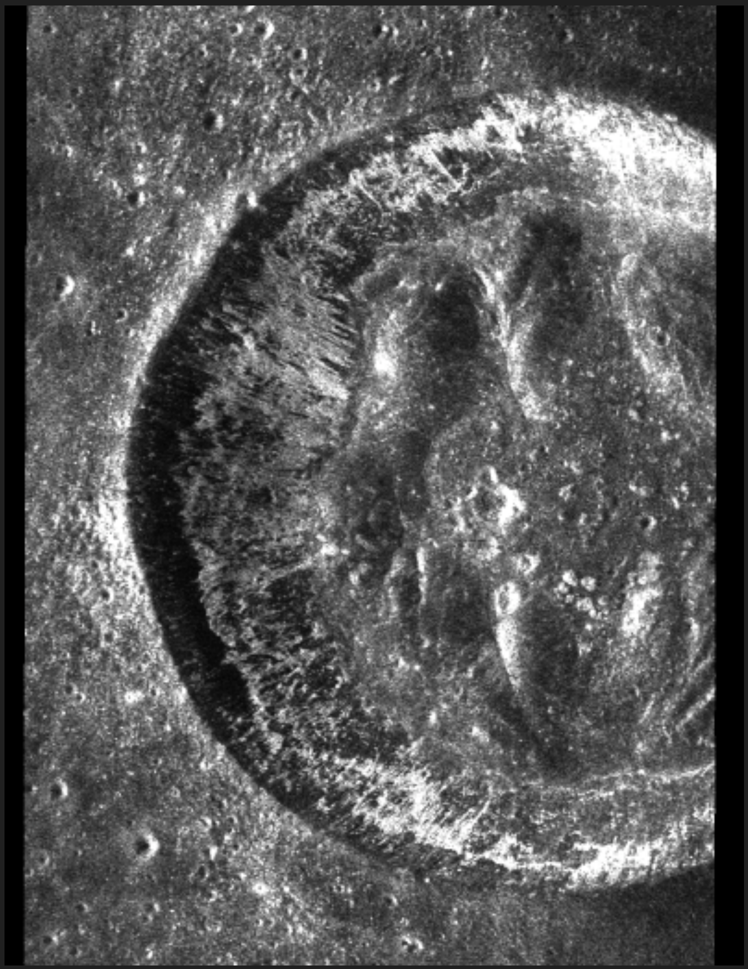
Typical strip is 1920 x 10 km

Mini-RF SAR data co-registered with Clementine UVVIS context mosaics.



Mini-RF & Optical Data are Synergistic

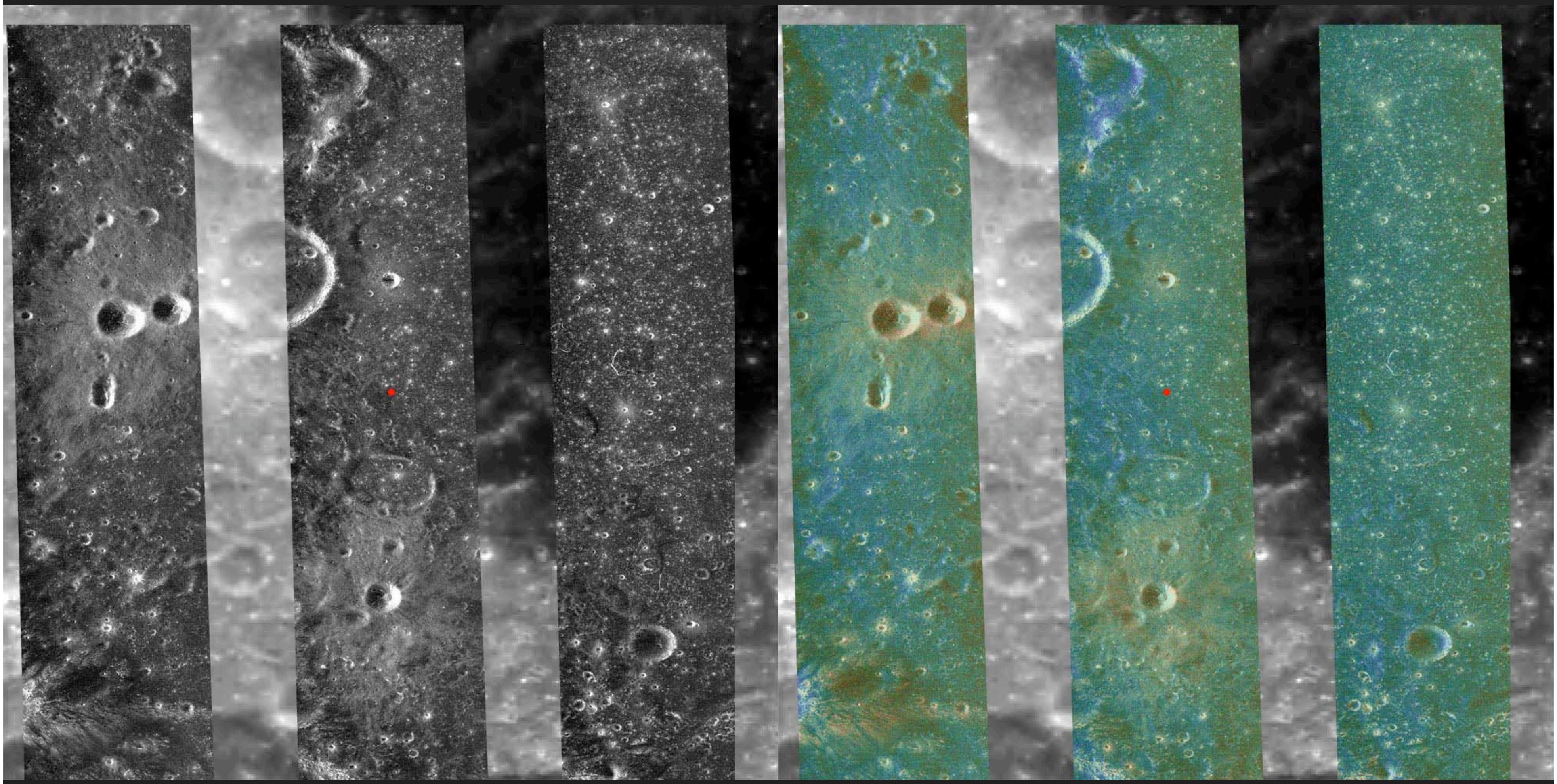
Bessel crater, D=16 km 21.8°N 17.9°E



Mini-RF OC S-band zoom

Apollo 15 Pan frame AS15-1123

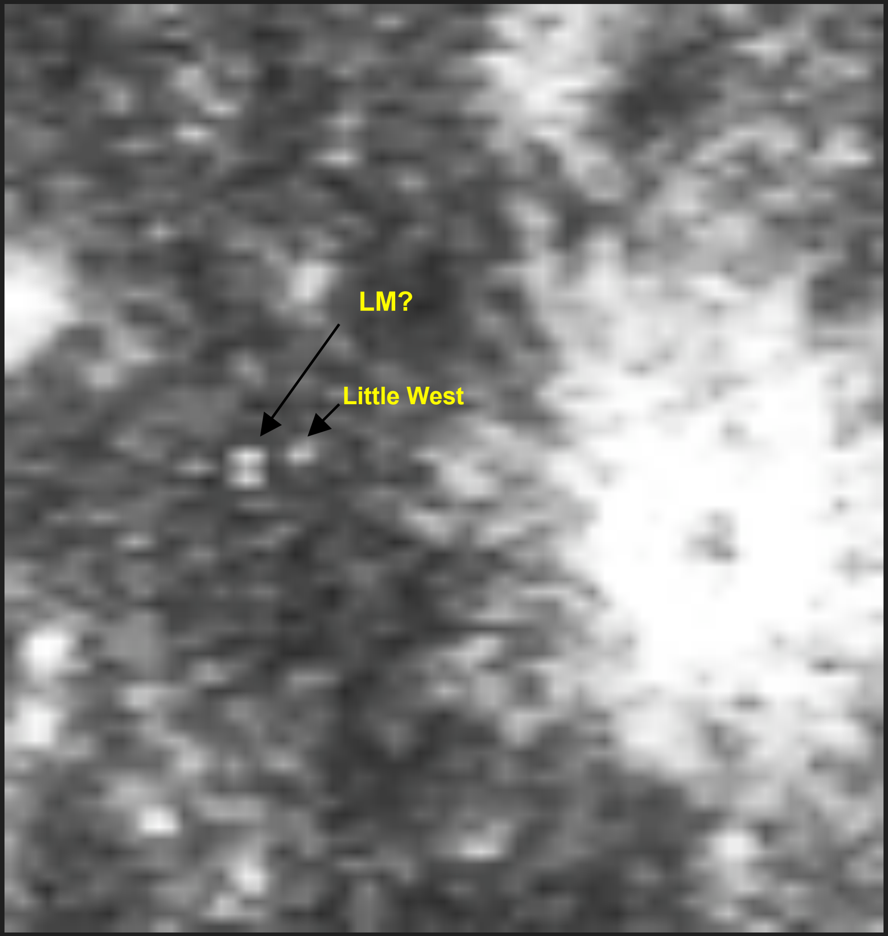
Apollo Basin



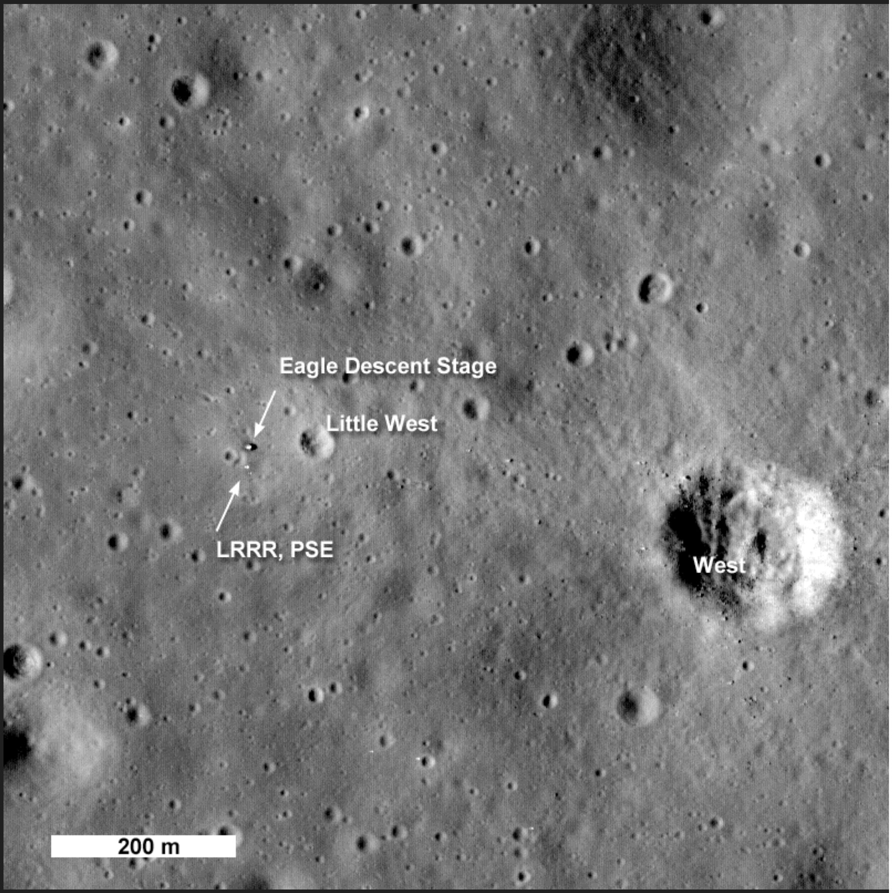
Total radar power over Clementine

Radar CPR over Clementine

Apollo 11

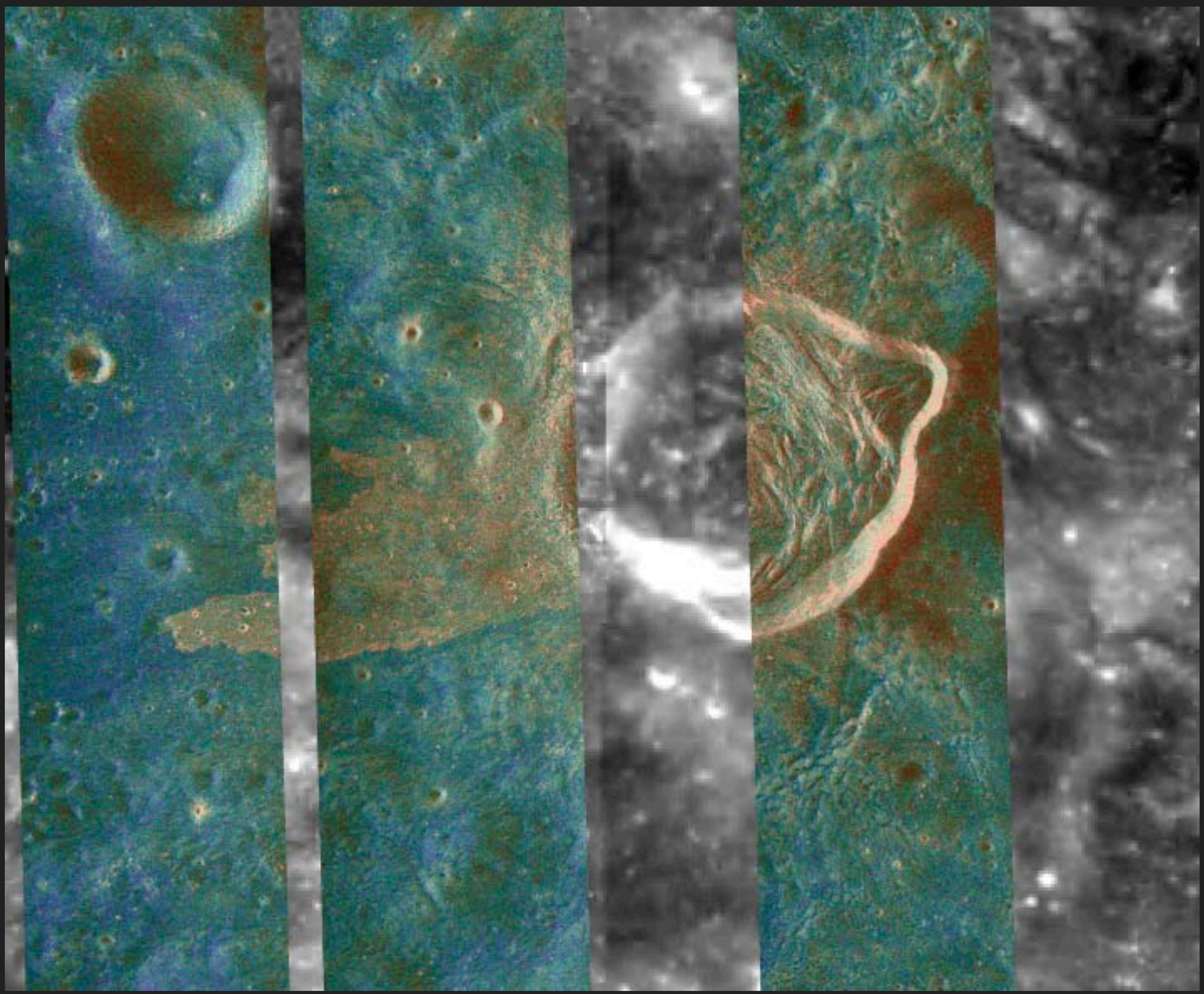


Mini-RF



LROC

Impact Melts



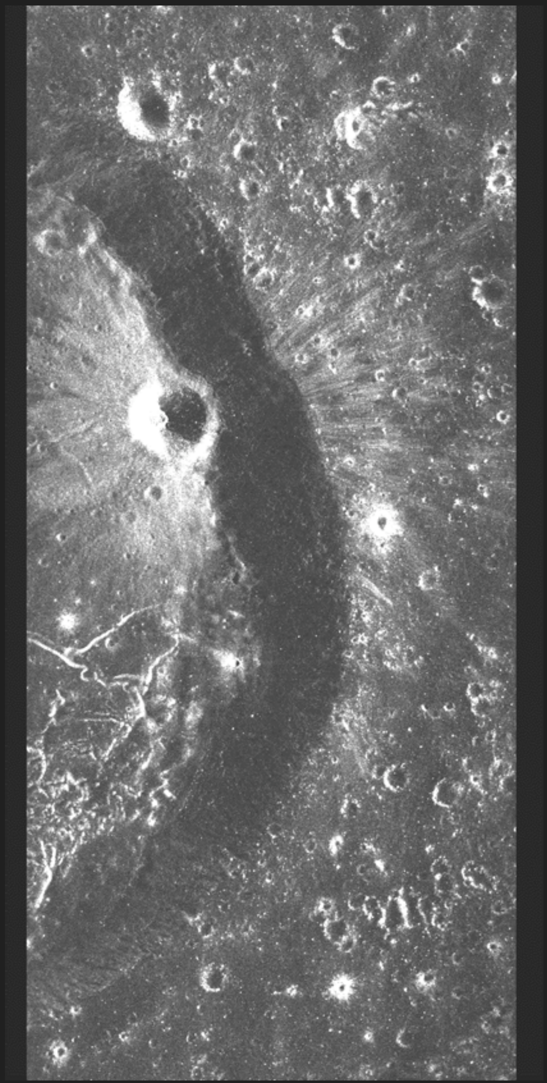
CPR over total radar power over Clementine

Gerasimovich D

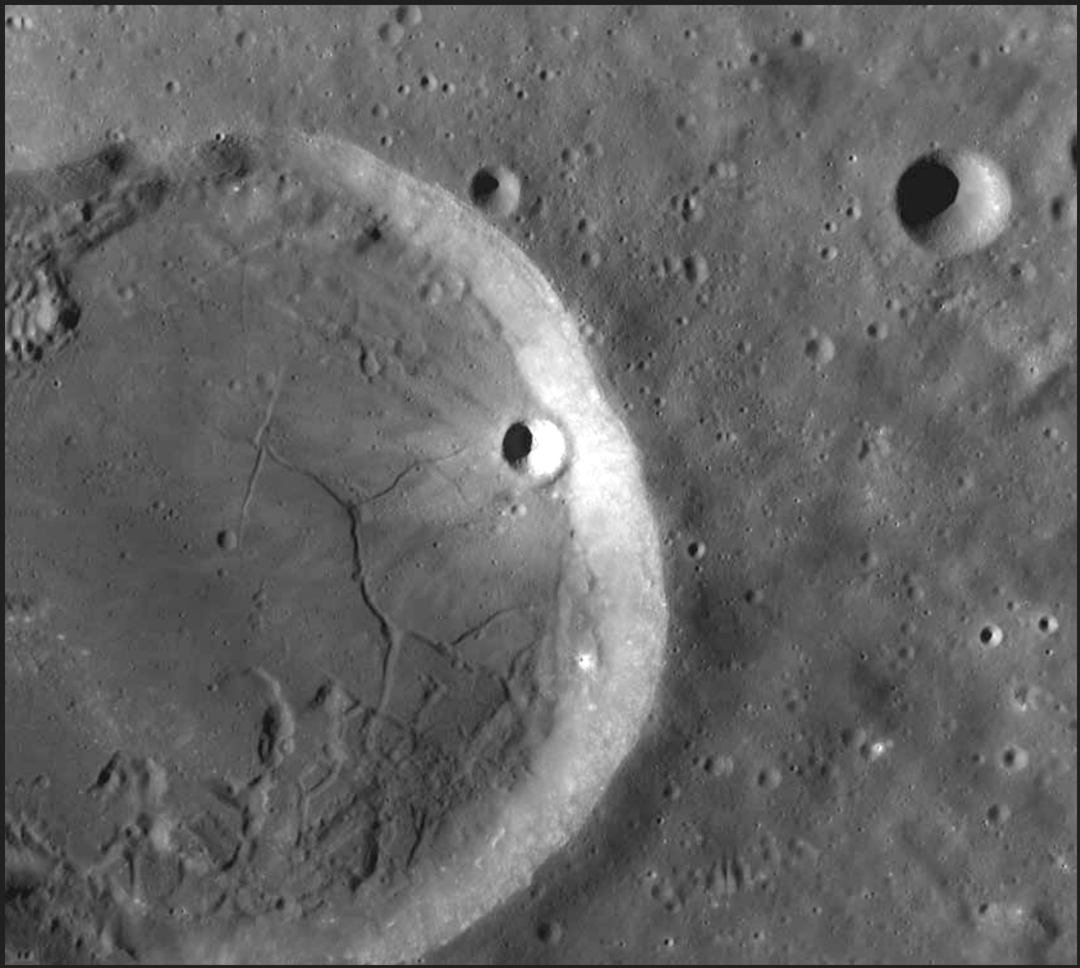
Impact Melts

Kopff

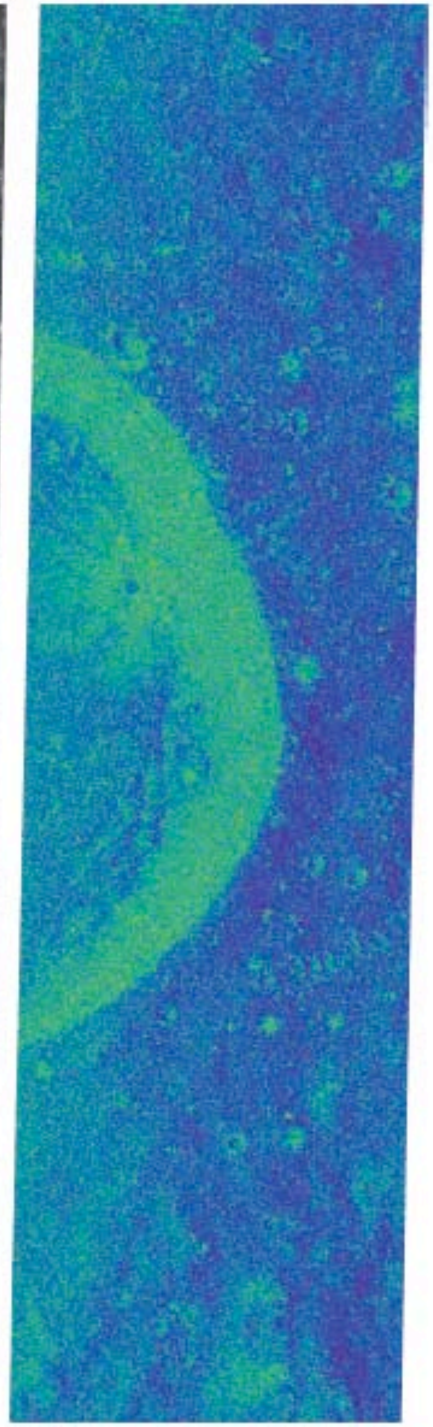
D=16 km 17.4°S 89.6°W



Mini-RF S1



Kaguya TC Mosaic

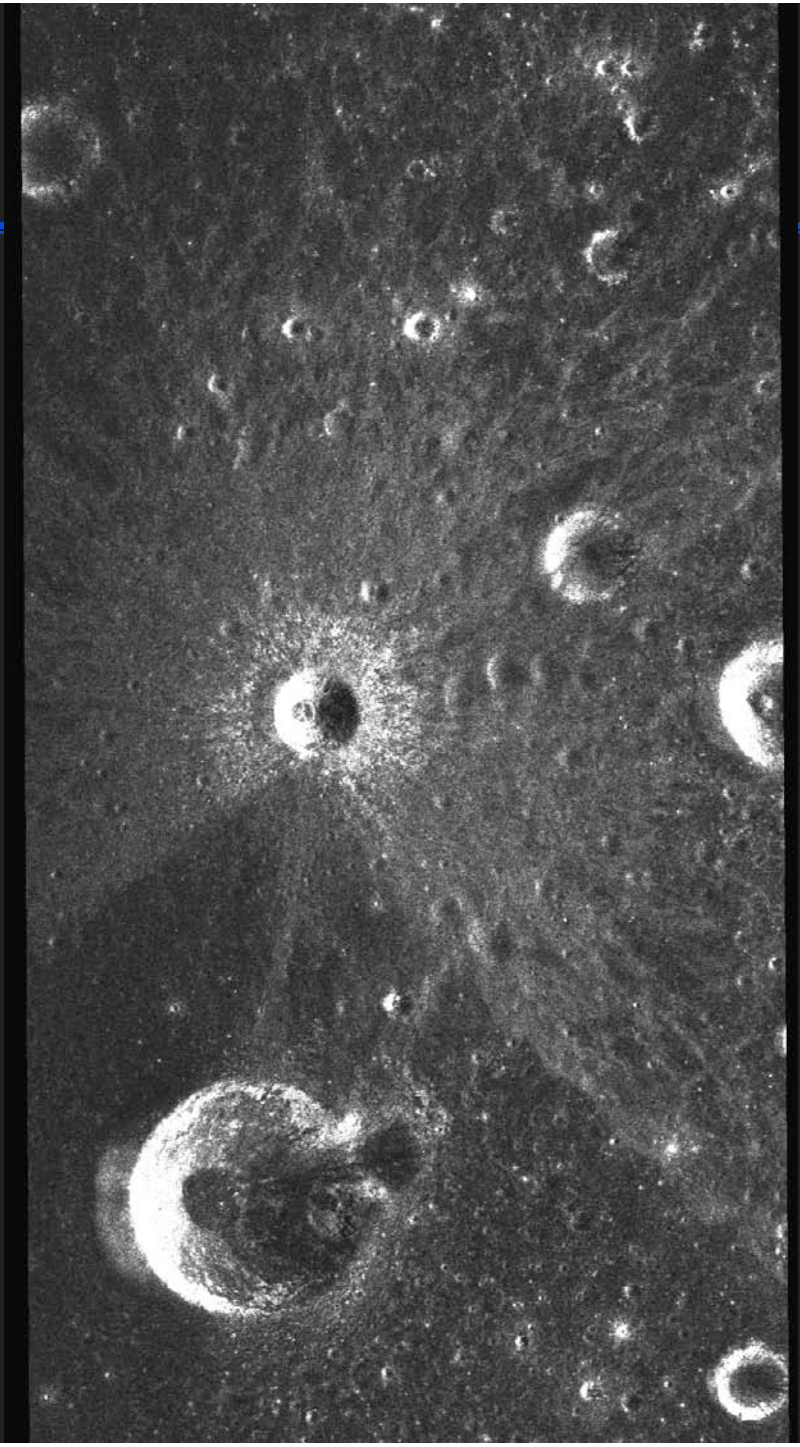


Mini-RF Reveals Information on Impact Process

Kopff crater, D=16 km
17.4°S 89.6°W

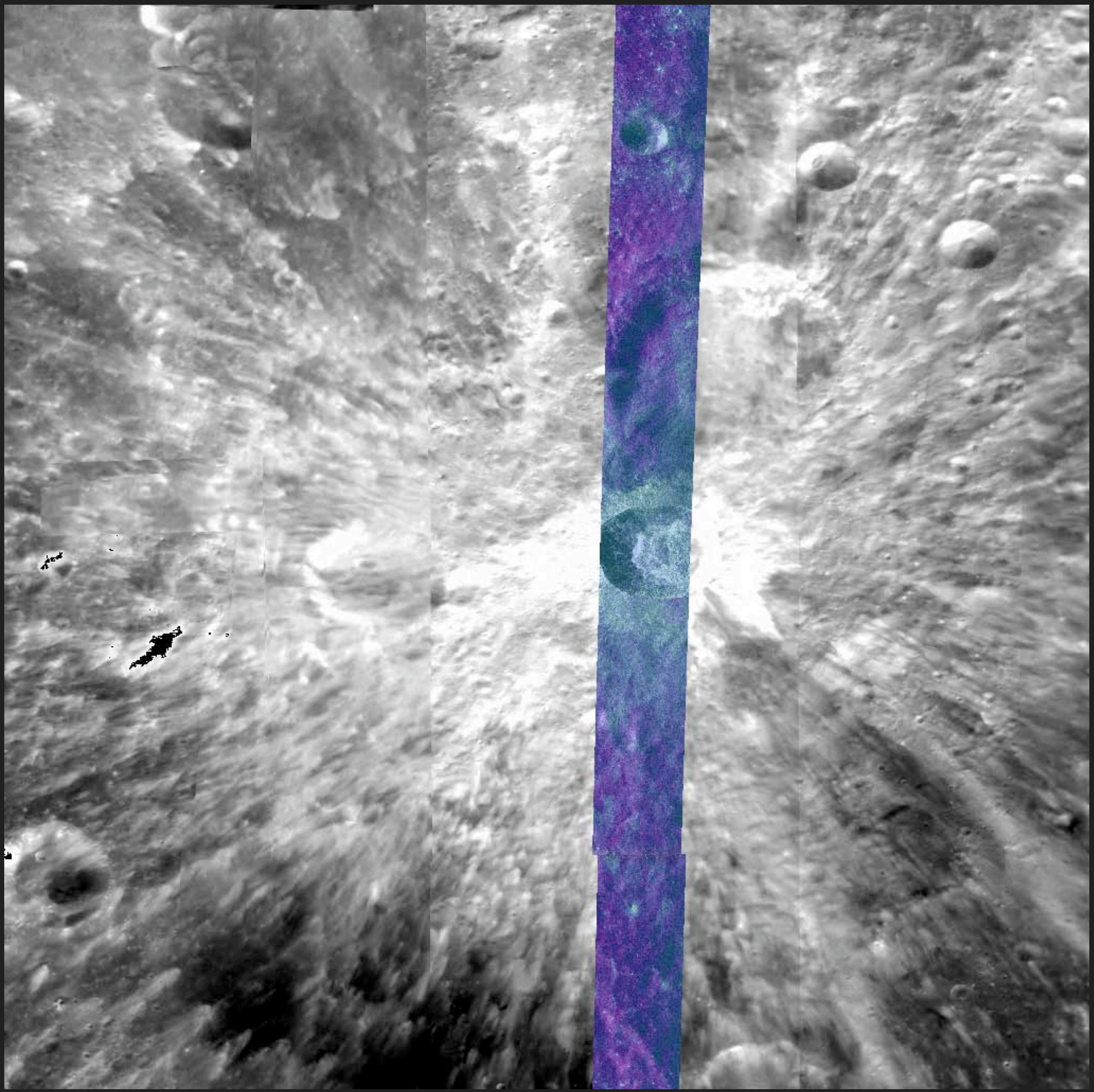
Mini-RF Maps Crater Ejecta Blankets

- Mini-RF maps surface roughness of the lunar surface. In doing so it can map the ejecta blankets that surround impact craters
- Mini-RF can see ejecta that is not visible in optical images.
- This could be because the extended ejecta causes subtle variations in surface roughness or that Mini-RF is detecting subsurface effects.
- Mapping the continuous and discontinuous ejecta blankets that surround impact craters will help us to better understand the physics of impact cratering.

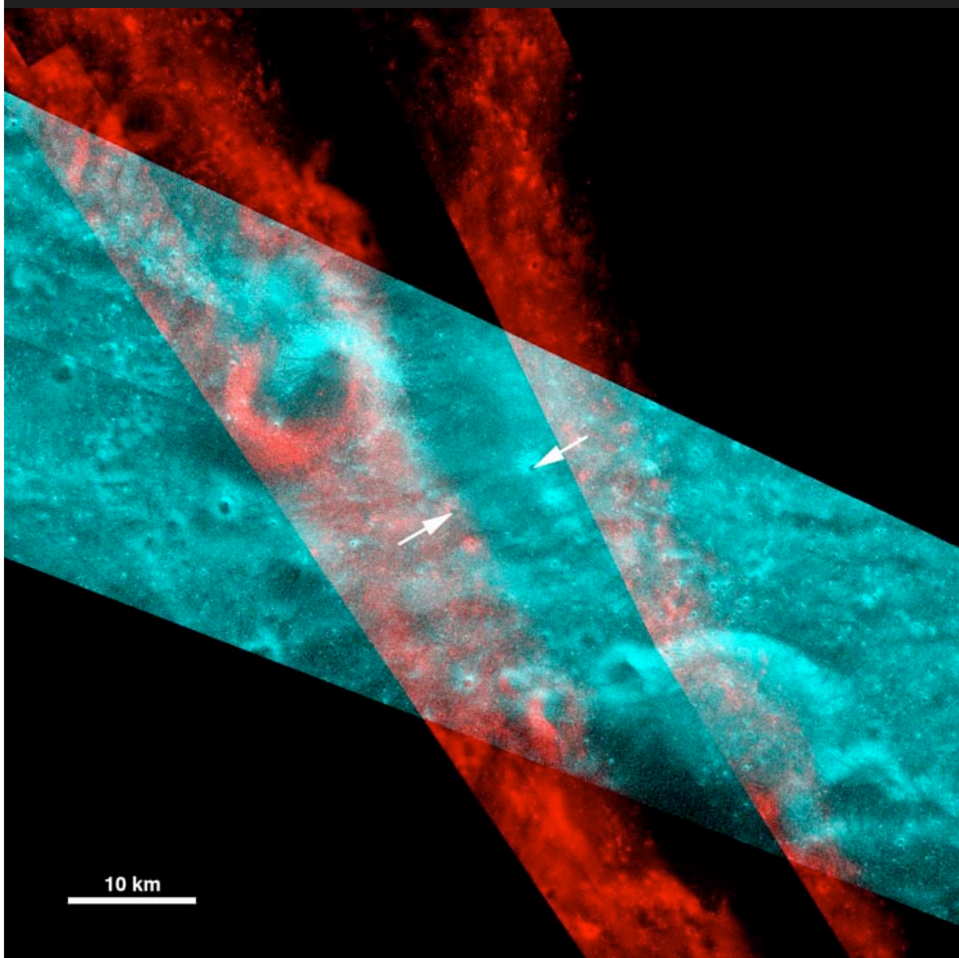


Oblique impact crater in mare Nubium. Both the continuous and extended ejecta blankets are detected

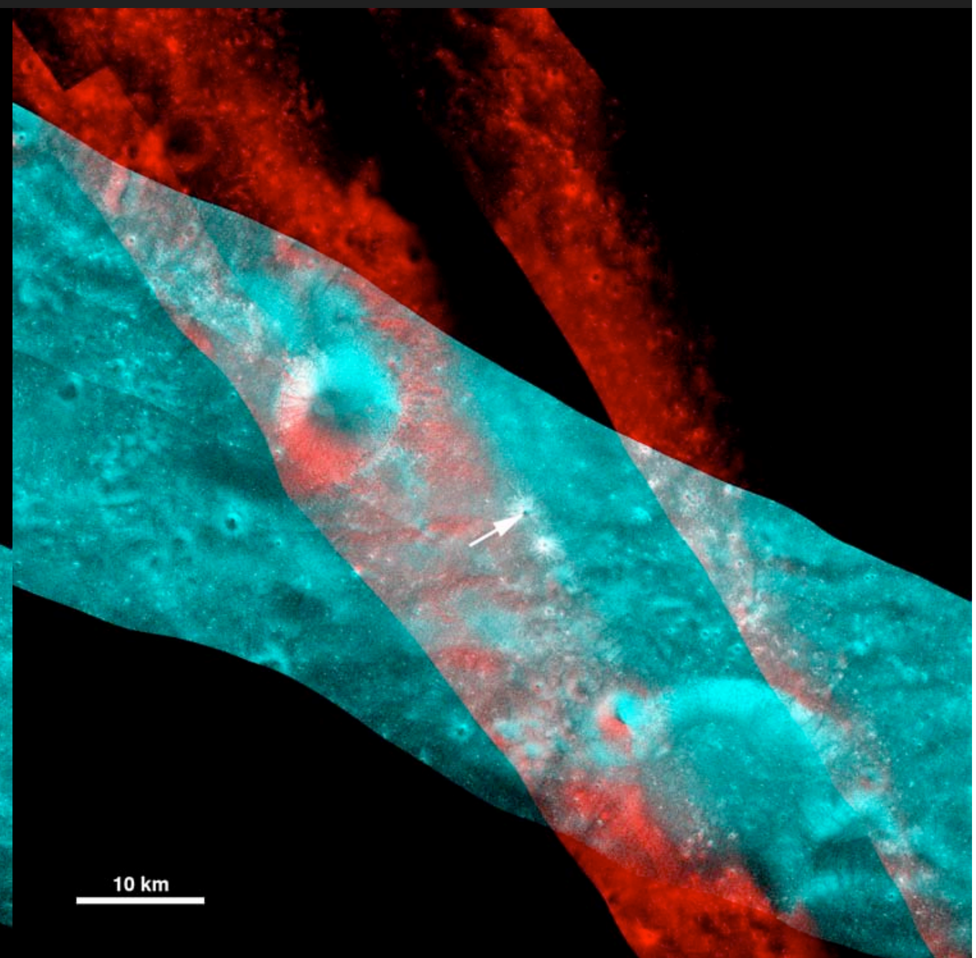
Giordano Bruno



Uncontrolled v. Controlled

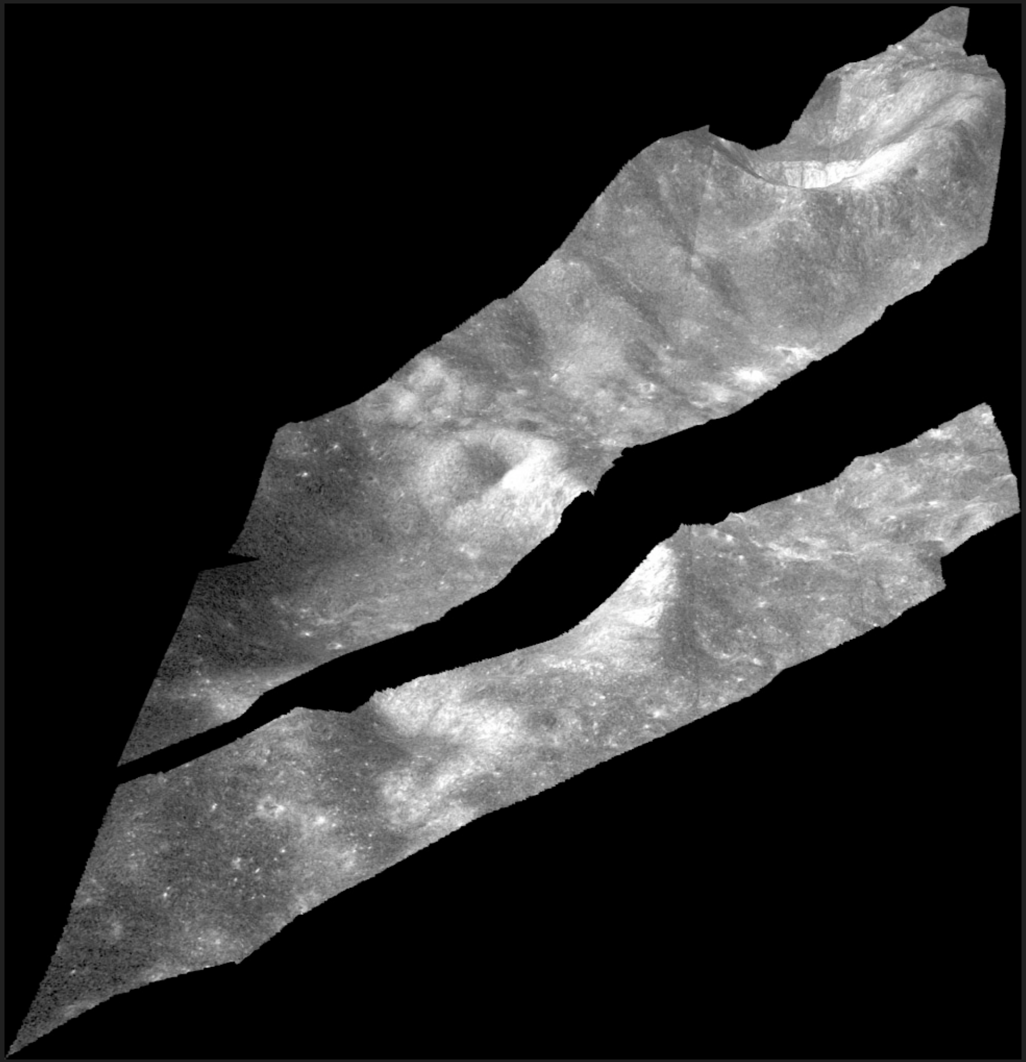


Uncontrolled mosaic, projected onto sphere. Offset between 2 sets of orbits is nearly 10 km

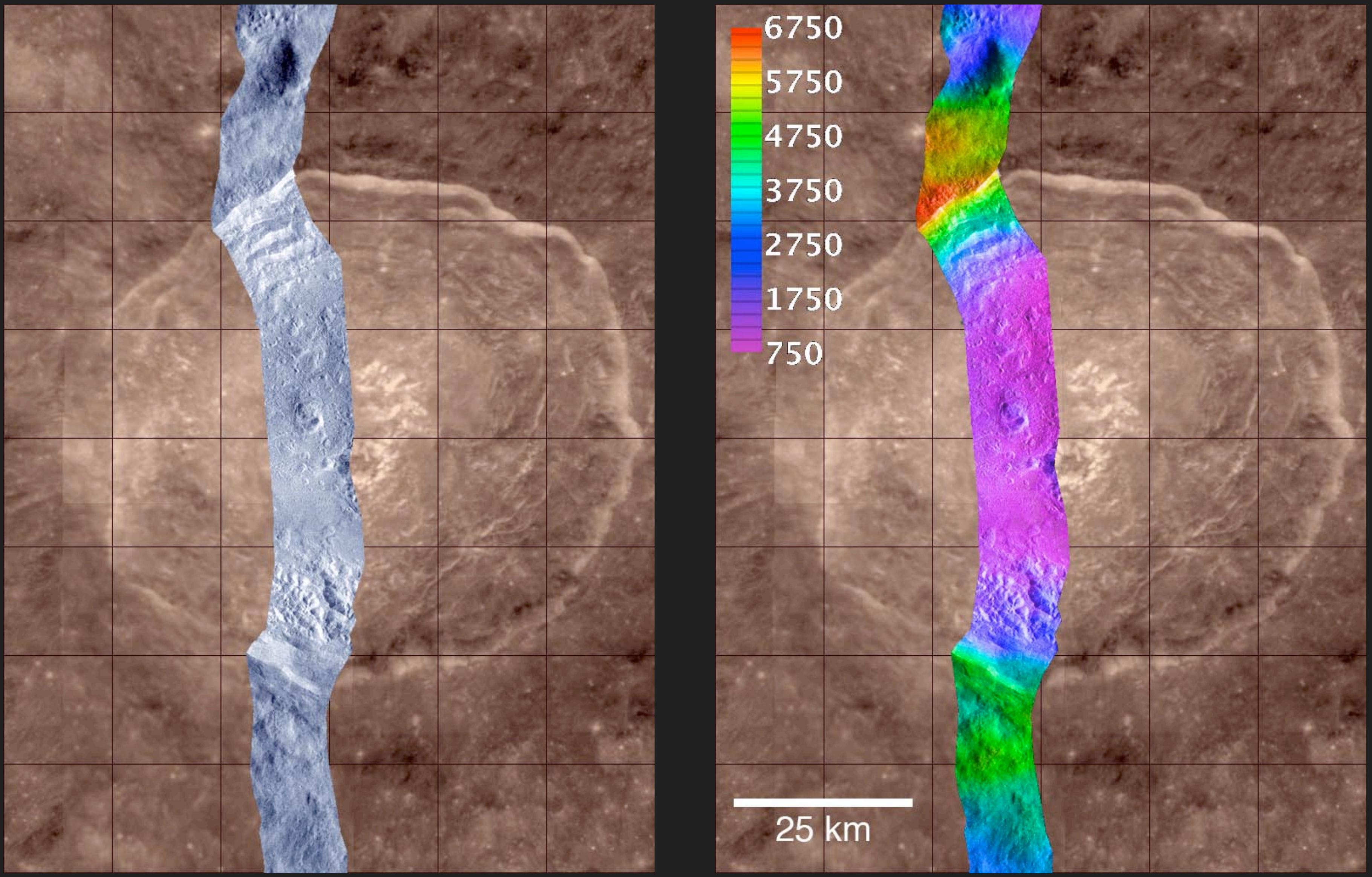


Controlled mosaic, projected onto Kaguya altimetry (ortho-rectified) reduces mismatch to too small to see

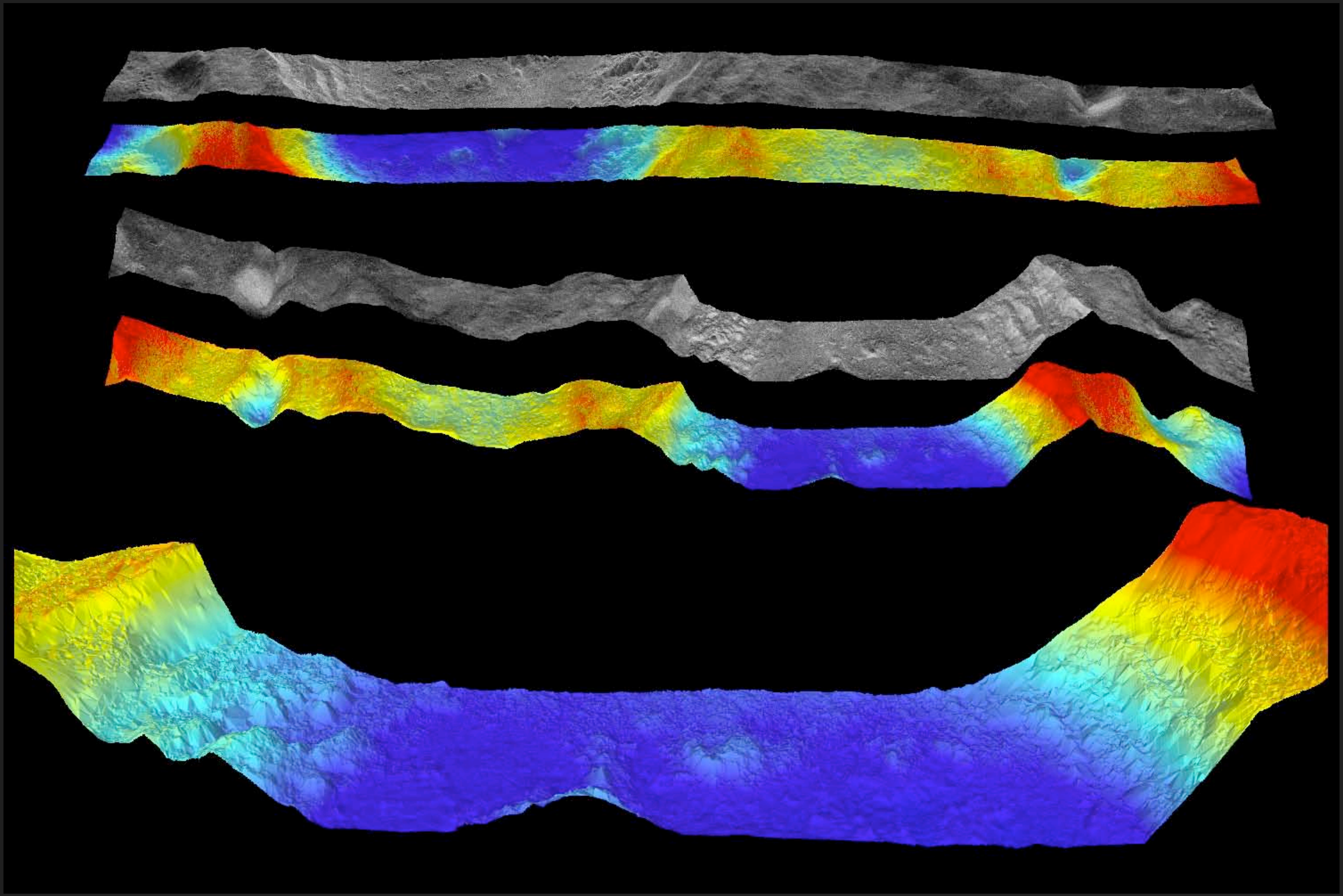
Cabeus Perspective View with Orthoimage Mosaic



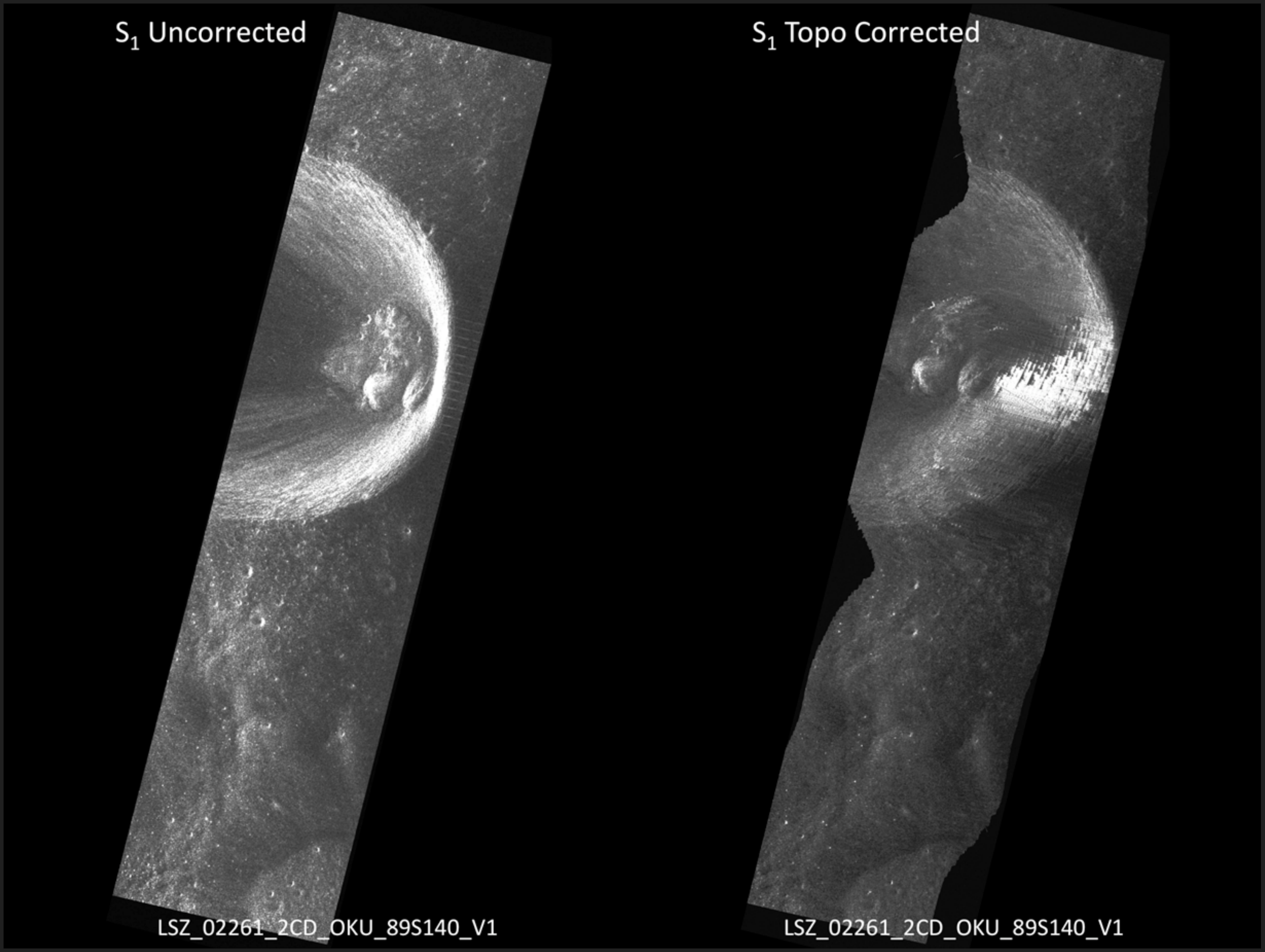
Roll-Derived Stereo of Jackson Crater



Roll-Derived Stereo of Jackson Crater



Shackleton

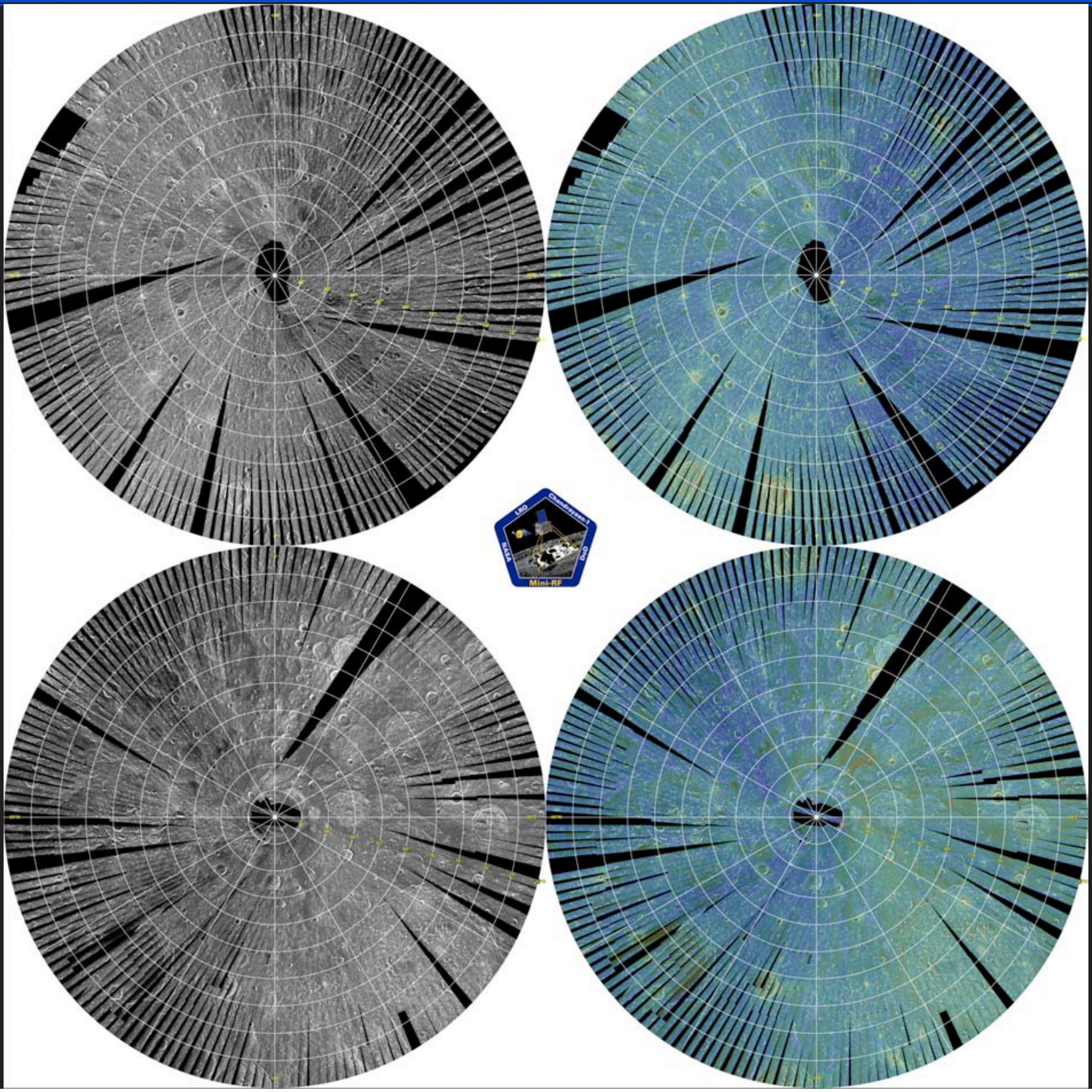


S_1 Uncorrected
S_1 Topo Corrected
LSZ_02261_2CD_OKU_89S140_V1
LSZ_02261_2CD_OKU_89S140_V1

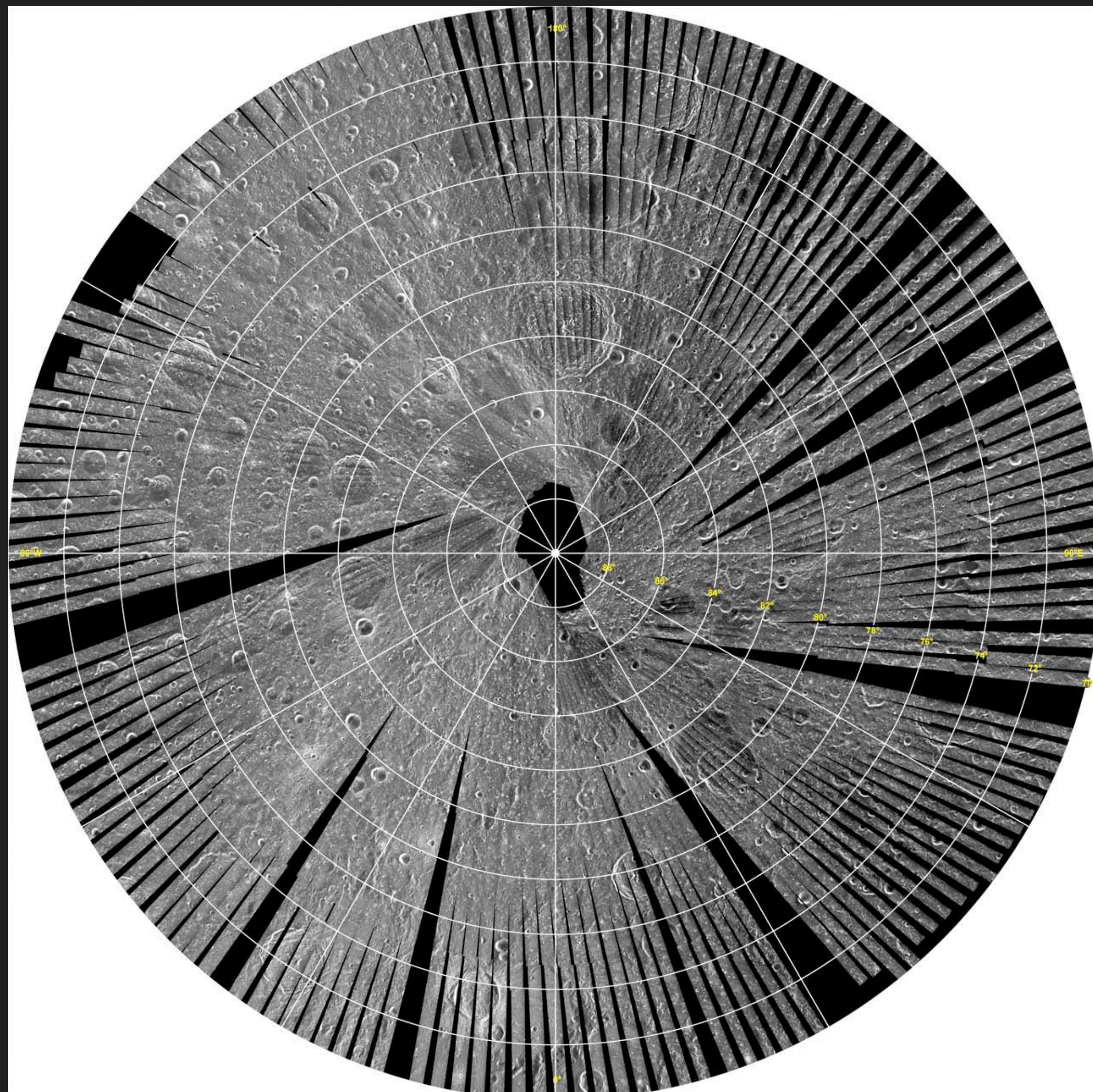
Polar Campaign

- During times of high solar beta (> 60°) the solar array remains in a locked position that is congruent with Mini-RF operations.
- Mini-RF is currently a little over half way through is first high-beta polar-mapping campaign
- We have been concentrating on acquiring S-zoom coverage

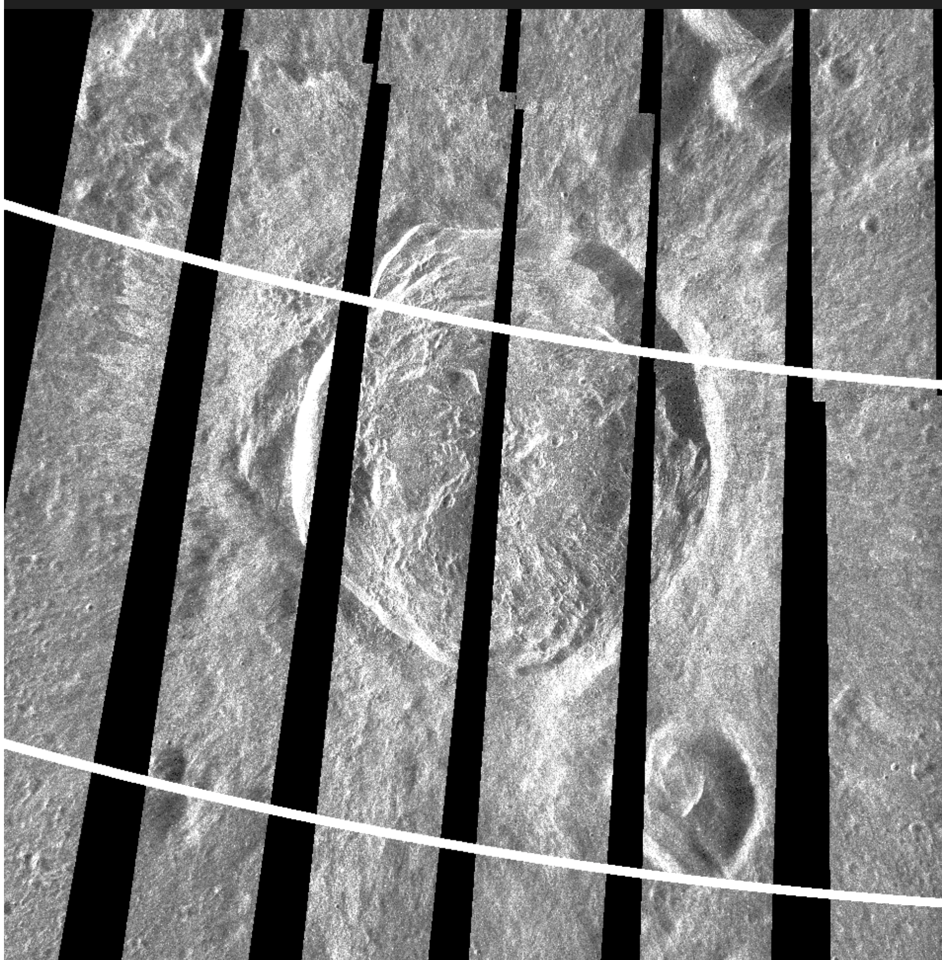
Polar Campaign



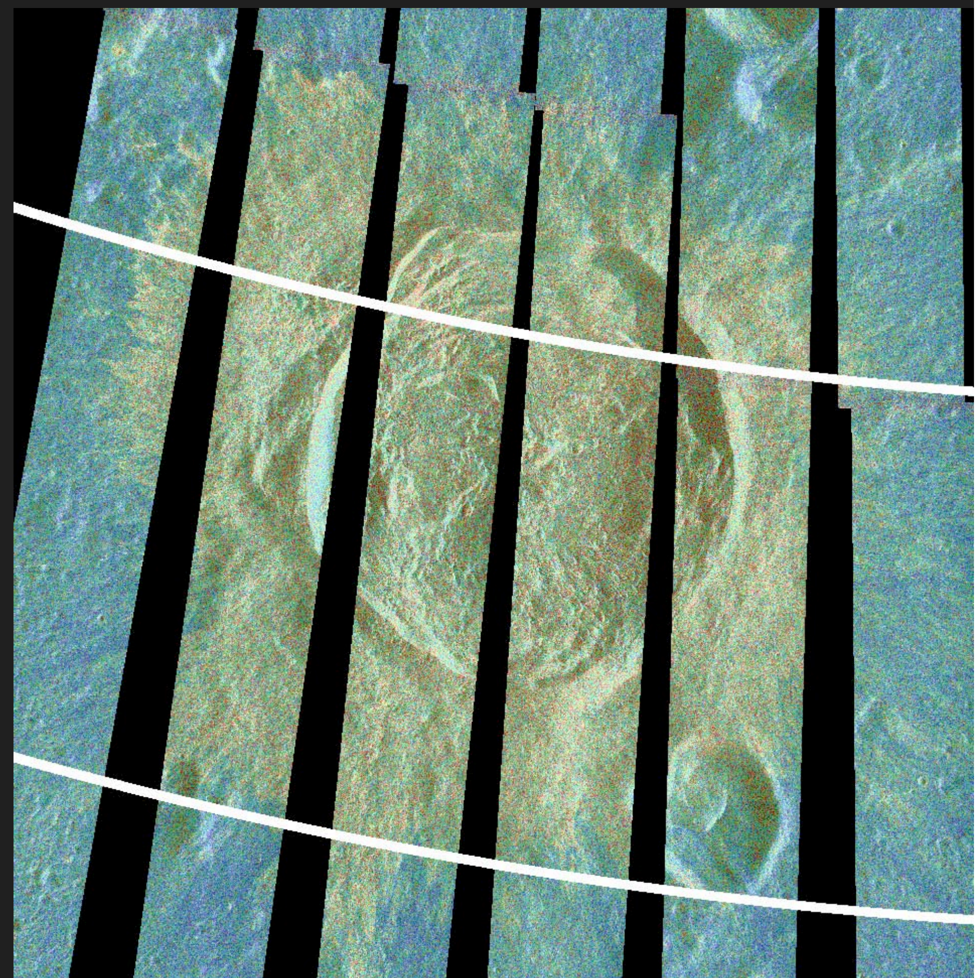
North Pole



Anaxagoras

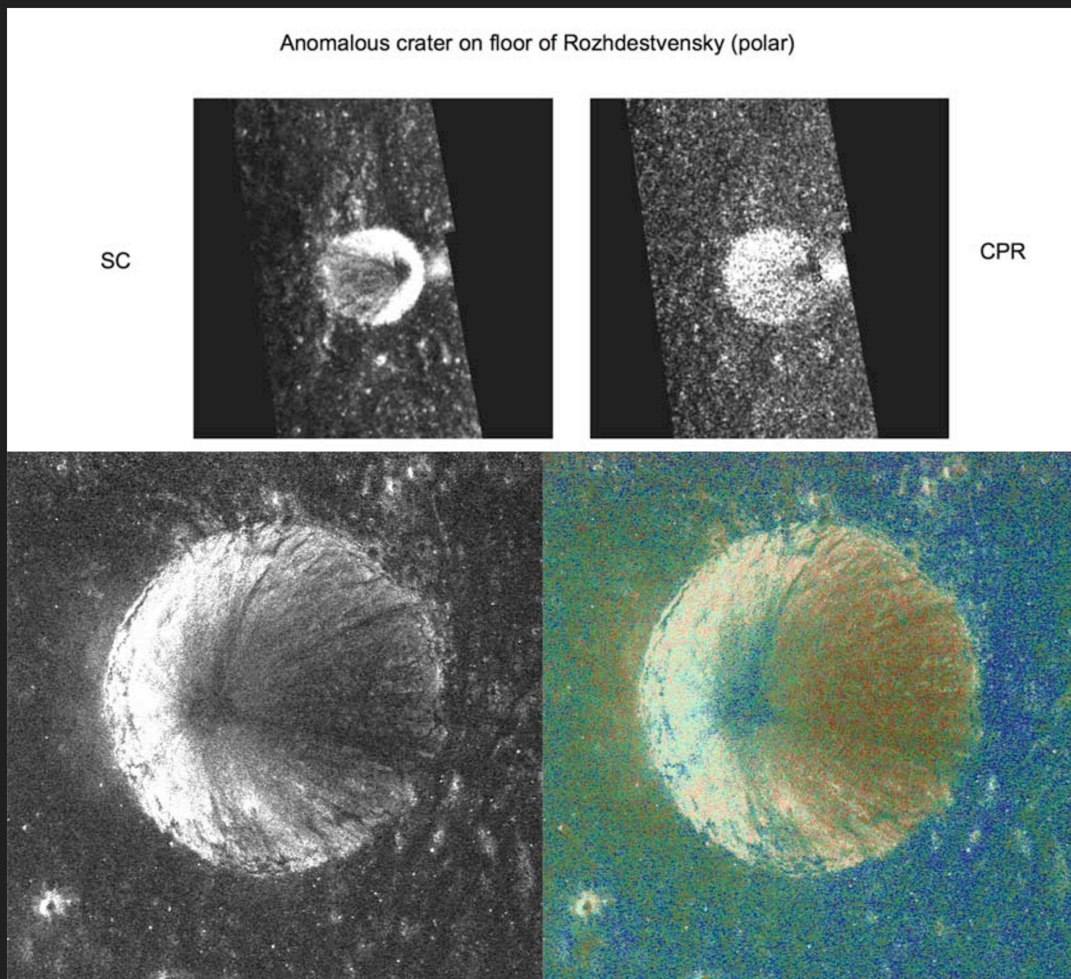


S1



CPR over S1

Rozhdestvensky N



Illumination direction

Summary

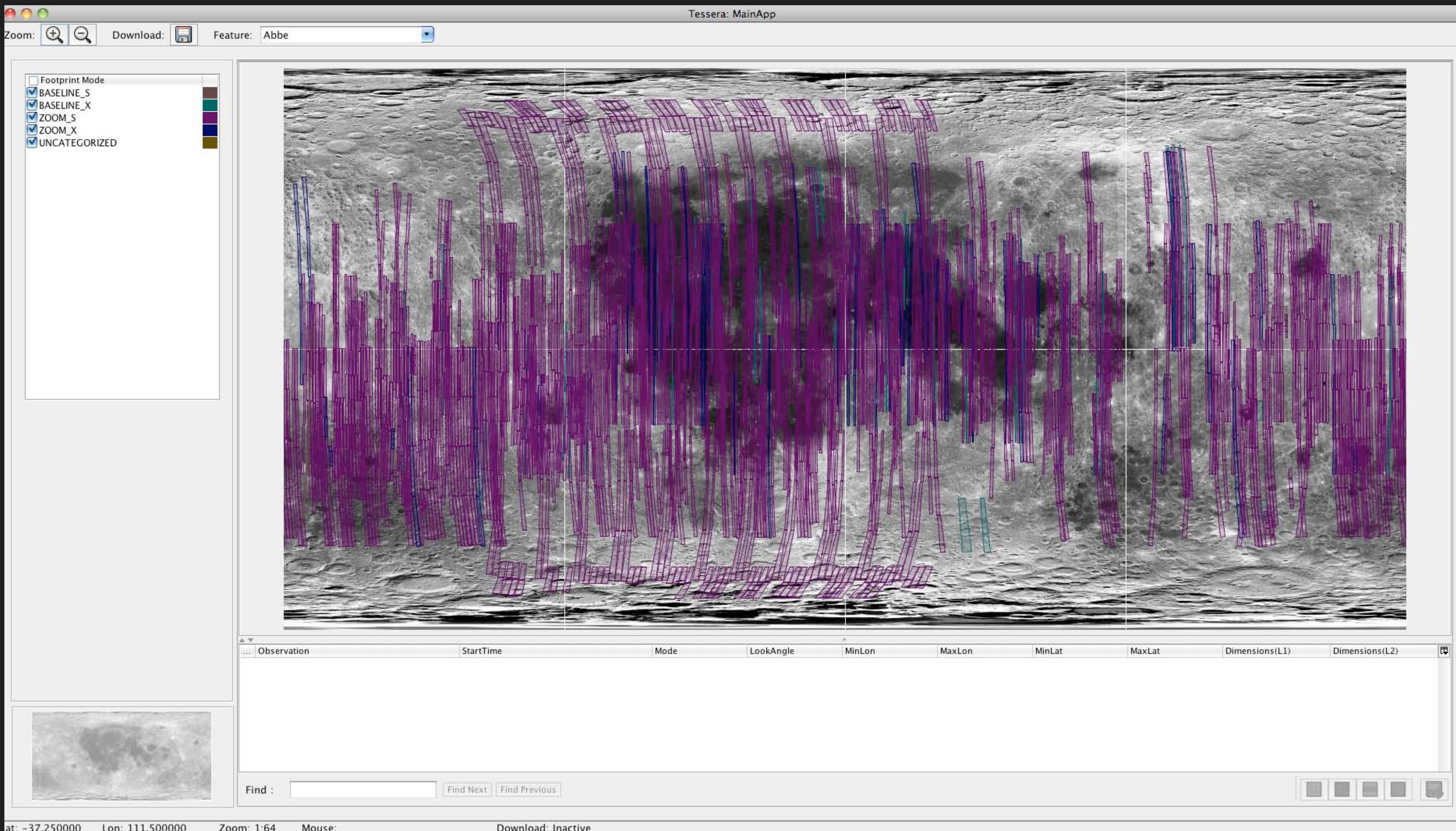
- Mini-RF is a highly capable instrument, obtaining data about lunar surface properties, nature of polar volatiles, surface topography, etc.

- Data acquisition strategy:
  - Non-polar data continuing at much reduced pace until beta angle ≥60°
  - Polar campaigns to be started at beta angle ≥60°

- PDS Delivery successful, >15TB of Mini-RF sent to PDS

- Please use the data!

Tessera



Tessera: MainApp
Zoom:
Download:
Feature: Abbe
Footprint Mode
BASELINE_S
BASELINE_X
ZOOM_S
ZOOM_X
UNCATEGORIZED
Observation
StartTime
Mode
LookAngle
MinLon
MaxLon
MinLat
MaxLat
Dimensions(L1)
Dimensions(L2)
Find :
Find Next
Find Previous
at: -37.250000
Lon: 111.500000
Zoom: 1:64
Mouse:
Download: Inactive